

Comments on and improvements for the following proposed Chemical Management System Guide are welcome. Please e-mail them to Billy.Lee@eh.doe.gov.

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CHEMICAL MANAGEMENT SYSTEM GUIDE

1.0 Introduction

This chemical management system guide follows the format and adopts much of the elements and requirements from Hanford's chemical management system. It incorporates best practices from other sources including other DOE field operations and private industry.

The purpose of this guide is to assist DOE sites in their development of a Chemical Management System (CMS) that controls onsite chemical activities, protects personnel, the public, and the environment from the hazards of chemicals, and that is compliant with applicable regulatory requirements.

2.0 Scope

This guide is applicable to all chemical management activities including the acquisition, use, storage, transportation, and final disposition of all chemicals. The scope includes hazardous chemicals as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200 and their Appendices A and B) and substances regulated under the OSHA Standard on Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119) and the EPA Risk Management Program (40 CFR Part 68).

3.0 Ownership

A manager should be identified by the site contractor as the responsible steward for the overall administration, management, and maintenance of their chemical management system. For sites having more than one contractor, each contractor will appoint a manager responsible for chemical management. These managers will share overall responsibility for the CMS.

4.0 Chemical Management System

The CMS consists of several key required management system components that are needed to support an onsite chemical safety program. These components are defined as follows:

- * Inventory Tracking and Control of Chemicals
- * Identification and Analysis of Chemical Hazards
- * Management of Change
- * Emergency Planning and Response

4.1 Inventory Tracking and Control of Chemicals

Elements of a system for the tracking and control of chemicals are as follows:

- * Acquisition
- * Use
- * Storage
- * Transportation
- * Final Disposition
- * Automated Tracking

4.1.1 Acquisition

Acquisition includes approval, procurement, onsite makeup, mixtures of chemicals, individuals/organizations bringing chemicals onsite and any other mechanism in which chemicals are acquired or brought onto the site.

4.1.2 Storage

Storage includes bulk, tank, piping, cylinder, and container storage of solid, liquid, or gaseous chemicals. Storage includes used and unused chemicals such as partially filled containers, chemicals stored in containers other than their original container, and chemical "heels" left within tanks, piping, or containers.

4.1.3 Use

Use includes routine and nonroutine chemical use and onsite recycling.

4.1.4 Transportation

Transportation includes all movement of chemicals subject to the U.S. Department of Transportation (DOT) or site transportation requirements.

4.1.5 Waste Minimization and Final Disposition

Waste minimization and final disposition includes consumption, recycling, and waste disposal. If the CMS does not cover waste management systems, including treatment, storage, and disposal facilities, it should, at least, provide interface with these systems.

4.1.6 Automated Tracking

Automated tracking includes electronic inventory of all chemicals from acquisition, storage, use, movement, to their final disposal.

4.2 Identification and Analysis of Chemical Hazards

Elements of a program to identify and analyze chemical hazards include:

4.2.1 Description of Process/Job/Experiment

Chemical information for process, job, or laboratory experiment enables the identification and understanding of hazards.

4.2.2 Hazard Analysis

Process hazards analysis, job hazards analysis, safety/environmental specialist walkthroughs, employee/supervisor safety meetings, or combinations thereof that identify the process, activity, or substance hazards and define the necessary controls to protect the worker, the public, and the environment.

4.2.3 Training

Formal training includes refresher training.

4.2.4 Inspections, Tests, Audits

Inspections, tests, audits include those for verification of mechanical integrity of equipment including vessels, tanks, and piping and for confirmation that procedures and safety practices are adequate and are being followed.

4.2.4 Hazard Review

Safety reviews include pre-start up hazard review for new/modified facilities, processes or laboratory experiments.

4.3 Management of Change

Management of change includes written procedures to manage changes (except for "replacements in kind") to chemicals, technology, equipment, and procedures in facilities, processes or experiments. The procedures also address:

- * The technical basis for the proposed change
- * The impact of change on safety and health
- * Necessary time period for the change
- * Authorization requirements for the proposed change

4.4 Emergency Planning and Response

Emergency planning and response includes an action plan. Plan includes procedures for

handling the full spectrum of emergencies from minor to catastrophic.

4.5 Infrastructural Support

The following are required infrastructural functions that are necessary to support management of chemical activities at the site:

- * Chemical safety
- * Emergency preparedness
- * Environmental reporting, documentation, and permitting
- * Fire protection
- * Industrial hygiene
- * Material safety data sheet (MSDS) system
- * Occupational medicine
- * Pollution prevention and waste minimization
- * Procurement
- * Quality assurance
- * Training and emergency preparedness drills and exercises
- * Transportation

Effective implementation of the CMS requires that all these functions be fully integrated.

5.0 Chemical Management System Requirements

All site contractor and subcontractors are required to create plans and programs to ensure that the following CMS Requirements are adhered to and maintained.

5.1 Required Administrative Controls

The administrative controls apply to policies, planning, operations, procedures, and management reviews.

5.1.1 Policy and Planning

* Site contractor should have clear written commitment by senior management through policy, communications, resources, and management review, to minimization, at each of the company's facilities, of releases to the air, water, and land, and in the generation of wastes resulting from chemical management practices.

* Site contractor CMS should be fully incorporated into the contractor's Integrated Safety Management System.

* Site contractor should commit to minimize the use and exposure to hazardous chemicals.

5.1.2 Operations

- * Chemical management operations, including acquisition, use, storage, transportation and final disposition should subscribe to OSHA, EPA, state regulations, and good industrial practice standards.

- * Chemical management operations should include formal program for the identification and analysis of chemical hazards for processes, job activities, and laboratory experiments.

- * Chemical management operations should include formal program on management of change to cover chemical safety.

- * Operations should include an action plan for emergency planning and response.

- * Operations involving significant quantities of hazardous chemicals, but less than threshold amounts under PSM (OSHA Std. 29 CFR 1910.119) and EPA RMP (40 CFR Part 68), should, never-the-less consider adopting elements of the PSM Standard as part of best management practices.

- * Chemical management operations should include a documented process for the identification, evaluation, and control of chemicals whose characteristics might have changed due to factors such as use (e.g., mixing), long-term storage, or radiolysis.

- * New MSDS(s) should be forwarded to the appropriate MSDS coordinators and shall be readily available to support hazardous chemical management.

- * Necessary chemical compatibility information should be obtained or developed and be readily available.

- * Interfaces between infrastructural support functions and chemical management system components should be defined and documented.

- * Chemical information, such as inventory, hazards, and MSDS, should be made available to support organizations such as Emergency Preparedness and Environmental Reporting, and other contractors as appropriate.

- * A list of applicable rules, regulations, and guidelines, including best management practices, should be developed by the site contractor, and the listed references be made readily available. Refer to Section 6.0 "Key Regulations Related to CMS" for examples.

5.1.3 Procedures

- * Each of the functional and operational areas of the CMS should be defined by a set of minimum specifications or requirements.

* A subcontractor or facility may develop their own specific procedures in addition to the site procedures, as long as the facility procedures address all applicable site specifications and/or requirements.

5.1.4 Management Review

* These CMS requirements document should be reviewed and updated every two years by the site contractor and the DOE field office.

* Contractor CMS performance should be reviewed by their senior management and DOE field office annually and documented as appropriate.

* Where there are more than one prime site contractor, each contractor's CMS performance should be reviewed annually by the DOE field office for consistency in performance among the contractors. Review to include an assessment of cooperation among contractors in the area of chemical safety management (e.g., in sharing and exchange of good practices, expertise, and excess chemical inventory).

5.2 Acquisition

Acquisition of chemicals should be documented in a controlled process that requires:

* Identification of roles and responsibilities of those individuals who have the knowledge and ability to safely manage chemicals.

* Identification of who is authorized to request, approve, and sign for receipt of chemicals.

* Identification of the individual (usually, the requester) and group responsible for a chemical from time of purchase to final disposition.

and addresses, as appropriate the following:

* Need for the chemical

* Use of available excess chemicals in lieu of new purchases

* Nonhazardous or less hazardous substitutes (these must be used in lieu of the hazardous chemical except when a documented substantiated reason is given as to why the substitutes can not be used)

* Amount required

* Stability/shelf life

* Suitability of storage facilities

* Final disposition plans

* Required safety documentation (e.g., MSDS)

* Input of chemical information into the site CMS tracking system.

5.3 Storage

Storage of hazardous chemicals requires, as appropriate, the following:

- * Proper and safe storage of chemicals at the appropriate facilities (e.g., flammable storage cabinet for flammable solvents)
- * Records of quantities and types of chemicals at each storage location
- * Control and documentation of addition or removal of chemicals from inventory at each location
- * Periodic physical confirmation and validation of inventory records
- * Documented maintenance and inspection programs that ensure facility integrity.

5.4 Transportation

Transportation of chemicals on the Site requires the following:

- * Coverage and compliance with procedure and all applicable regulations (e.g., DOT)
- * Documentation to ensure chemical records are updated appropriately.

5.5 Use

Use of chemicals requires the following:

- * Appropriate hazards analysis either generically (e.g., for a store stock item) or as part of a facility specific chemical process, operation, or job planning activity
- * Hazard analysis to include possible interaction of chemicals, not only with other chemicals, but also with their environment, containment vessels, air or water, and other utilities, and structural containment materials
- * Analysis to include normal, transient, and accident conditions (e.g., interaction with chemicals stored or used nearby that may become involved)
- * Appropriate use of design and controls in the following hierarchy: inherently safe design, engineering controls, administrative controls, and personal protective equipment
- * Tracking, if new hazardous chemicals are created and not immediately used
- * Coverage by procedures and/or a MSDS as appropriate.

5.6 Waste Minimization and Final Disposition

Waste minimization and final disposition of chemicals requires the following:

- * Emphasis on recycling as the first choice in lieu of the purchase of new chemicals
- * Declared excess chemicals shall be recycled based on government deadlines for: internal use at any other area on site; external use by other sites; and community use by referred organizations and local businesses
- * A documented process, compliant with all applicable regulations, to identify in a timely manner chemicals appropriate for recycle, reuse or waste disposal

- * Compliance with all applicable laws and regulations
- * Transfer of relevant chemical documentation and information to the appropriate infrastructural support functions.

5.7 Automated Tracking

Automated tracking of chemicals requires the following:

- * Complete record of site chemicals indicating as a minimum: locations; amounts; use(s); hazards; and custodians
- * User friendly accessibility
- * Ease of interfacing information
- * Mechanism for physical inventory and control using bar coding
- * Capability for generating required data and reports
- * Flexibility to respond to additional requirements

5.8 Staff Qualifications and Training

Staff should be qualified and trained to conduct the CMS program effectively.

- * Site chemical safety experts must have technical competence to recognize and analyze the full range of chemical hazards presented by the materials in their facilities.
- * Updated training must be provided for new chemicals and new hazards.
- * Personnel who use chemicals and personnel who are potentially exposed to chemicals should be provided with appropriate training.

5.9 Management Review of Chemical Management System Performance

All contractors are required to establish a system that provides quantifiable, documented and measurable performance of their CMS. Contractors shall review their CMS performance with DOE field office annually. All CMS management reviews shall include the following, at a minimum:

- * Corrective action and associated results
- * Performance results for objectives and targets
- * New or changed legislation and other requirements
- * Incidents, noncompliances, and performance inconsistent with the CMS
- * CMS monitoring and measurement data and accomplishment

6.0 Key Regulations Related to CMS

The following list is not intended to be all inclusive, but rather to provide guidance regarding some of the pertinent regulations applicable to all prime contractors:

- * 29 CFR 1910 OSHA Subpart Z - Toxic and Hazardous Substances
- * 29 CFR 1910.20 - OSHA Access to Employee Exposure and Medical Records

- * 29 CFR 1910.119 - Process Safety Management of Highly Hazardous Chemicals
- * 29 CFR 1910.1200 - OSHA Hazard Communication Standard
- * 29 CFR 1910.1450 - OSHA Occupational Exposure to Hazardous Chemicals in Laboratories
- * 29 CFR 1926.59 - OSHA Hazard Communication for Construction Activities
- * 40 CFR Part 68 - EPA Risk Management Program
- * 40 CFR 370 and 372 - EPA Superfund Amendments and Reauthorization Act (SARA), Title III of SARA, is known as the Emergency Planning and Community Right-to-know Act
- * 40 CFR 261, 262, and 263 - EPA Resource Conservation and Recovery Act (RCRA)
- * 49 CFR - Transportation
- * State Regulations

Appendix A. Operational Details for CMS Software Program

Additional details concerning the CMS software needs for chemical inventory and tracking is presented.

A.1 Material Safety Data Sheet Database

A MSDS must be available for each chemical and chemical combination in the system. The CMS should provide each chemical record in association with a MSDS sheet through either direct link or reference number. Scanned (image files) MSDS sheets are acceptable short-term, but a text file format is required long-term. The text file MSDS database will allow the CMS to access chemical constituent "breakdown" information automatically, and thereby improve the efficiency of EPCRA reporting.

A.2 Chemical Information

Mandatory information about the location of chemicals includes:

- * Area - Described by major areas recognized on the site (e.g., 200 East)
- * Facility - Described by using the site facility name (e.g., Waste Storage Facility)
- * Building - Described by common nomenclature used in existing documents (e.g., 500)
- * Room - Room designation listed under the building's layout plan (e.g., 20)
- * Cabinet - Cabinet identification that is clearly marked on the exterior of the cabinet (e.g., C-10).

In order to provide flexibility, optional entries may also be made to specify what shelf or shelf segment the subject container is located at. The CMS must also have fields for the following data/information:

- * Chemical name (International Union of Pure and Applied Chemistry name)
- * Common name and synonyms
- * Chemical Abstract Service Number
- * Manufacturer

- * Molecular formula
- * Concentration
- * Hazard categories (NFPA, DOT, OSHA)
- * Requestor/owner
- * Container type, size (volume)
- * MSDS number
- * Chemical constituent breakdown (for hazardous materials)
- * Intended application
- * Status (ordered, received/available, consumed, excessed, disposed)
- * Expiration date (highlighted when critical)
- * Chemical compatibility designator

A.3 Purchasing Forms

The CMS must produce the necessary procurement forms/files such as:

- * Bill of material requisitions
- * Just-in-time requisitions
- * Central store purchases
- * Other type purchases

The software system must be able to generate a hard copy of the forms and allow for input into the inventory/tracking database. Purchasing forms shall contain information such as, but not limited to:

- * Requestor
- * Type of request (hazardous/non-hazardous)
- * Chemical
- * Quantity
- * Receipt location
- * End user location
- * Company
- * Regulated
- * MSDS status
- * Verification of non-availability
- * Verification of alternative(s) consideration

This information would be input into the CMS software at the time of request and a unique identifier assigned until the material is received and processed into the inventory/tracking component of the CMS software.

A.4 Bar Coding

Labeling containers with a unique numerical identifier enables tracking, reporting, and identification of individual containers. This shall be satisfied with a bar coding system that

assigns a numerical value to each individual container. Bar code numbers would be assigned to each container at the time of purchase; however, the system would also have the capability to assign numbers to those products not purchased through procurement (e.g., subcontractor brings material on site). Bar code labels must be attached to each container either directly or to a tag that is attached to the container. Additional required information(not input at time of purchase) would be entered into the database at time of receipt. Any inventories, relocations, or disposal shall be done using bar code entry data. Individuals would use a bar code reader or enter the bar code numerical value into the system to edit entries. Once the product has been used up or disposed of, the bar code label shall be returned by routing either the physical label or the identifier number to a single point of contact responsible for tracking the chemicals for each company/facility.

The system would also have the ability to generate forms to assist in taking inventories which can be manually entered into the CMS. This would accommodate onsite facilities too small to justify purchase of a bar code reader.

A.5 Inventory Updating/Reconciliation

The CMS must have the capability to accept and store inventory records of chemicals. It must provide a mechanism to conduct inventories both electronically (bar code) and manually (print out) and provide reconciliation for chemicals new to the inventory area, moved from the inventory area, or missing. The CMS must provide easy retrieval of archived records.

A.6 Reporting Functions

The CMS must have the capability to generate reports for the following:

- * Reconciliation: Periodic inventory reports will be conducted at each chemical storage facility. This report will be compared to the inventory status currently recorded on the system. Any difference shall be reconciled or noted. The system will have the ability to create a report showing those differences.

- * EPCRA: Where necessary, the system shall have the capability to satisfy EPCRA reporting needs and generation of the required reports.

- * Emergency Response: The system shall have the ability to generate reports for those organizations providing emergency response. These include the local fire department and hazardous material response team.

- * Safety Reports: The system shall generate reports for safety. These reports will satisfy risk management plans, accidental release programs, reports based on safety and environmental thresholds, OSHA reports (e.g., worker exposure), and any other necessary reports. The system shall have the ability to generate MSDS sheets for each chemical and chemical combination stored on site.

- * Custom Reporting: The system shall also have the capability to generate reports by application depending on the needs of the individual user. Examples of these may be a list of chemicals expiring on a specific day, the types of materials stored at a certain facility or the types of chemicals stored by a certain organization.

A.7 Input Capabilities

The CMS software must be able to support:

- * Single screen input
- * Multiple screen input
- * Bar code reader input
- * Batch input

Some onsite facilities may have limited chemical inventory/tracking systems in place; the data in these systems must be able to be saved and downloaded into the CMS using a batch process download. Smaller facilities may require download of data in small numbers ranging from a single chemical to several hundred chemicals, therefore the CMS software must allow for baseline data entry at both the computer screen and bar code reader down load.

A.8 Query/Search Function

System users should have the ability to use a query function for searching for data in fields. Examples are as follows:

- * Chemical - for use in searching for other storage locations that store a particular chemical
- * Expiration date - for use in searching for chemicals nearing expiration
- * Facility - for use in determining chemicals at a certain facility or several facilities
- * Excess - for use in searching for materials available through excess

A.9 Graphical User Interface

The CMS software system must have:

- * Easy accessibility to the input and output screen
- * Quick search and retrieval of information
- * A system that uses windows and "point and click" retrieval of input screens and search/query vehicles
- * Other user friendly features such as: means to trigger data fields that force the user to insert required information or review pop-up list/screens that contain the necessary information; pop-up lists that have search capabilities.

A.10 Training for Software Database and Query/Search

Knowledge of data input, manipulation of data, baseline inventory queries, and reporting capabilities of the CMS are the minimum areas that should be covered under the training program.

A.11 Example of a good CMS

A system that has many features of the above inventory and tracking requirements is the PNNL chemical management system. Assistance support for software development in this area can be directed to:

Technology Transfer Department
Pacific National Northwest Laboratory
P.O. Box 999
Richland, WA 99352
Tel: 509-375-2530 or Fax 509-375-6499

A comprehensive CMS system would include requirements for the management of chemical activities as given in OSHA 29 CFR 1910.119 Process Safety Management of Highly Hazardous Chemicals.